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The invention relates to a door having a built-on device for connecting a drive mechanism to a shaft for introducing an operating movement into a one-piece or sectional door leaf, particularly a door leaf which is movable with a vertical component, preferably of a sliding, rolling, or one-piece or sectional up-and-over door, preferably with the aid of cables which can be wound onto or unwound from cable drums non-rotationally mounted on the shaft and engage with their end remote from the drum on the door leaf, and optionally with a torsion spring device to compensate for the weight of the door leaf, with a carrier portion non-rotatably mounted on the shaft, to which the output power take-off member of the drive motor assembly can be connected, particularly via a flange connection. A door which has the features of the preamble of claim 1 is known from US-A-1 827 433.

Shafts for operating door leaves of the type in question are known; generally, they are door leaves having a vertical component of movement in the course of the movement between the closed and open positions and *vice versa*, as is known with sectional and one-piece up-and-over doors, but also in roller and sliding doors in the sense used here, wherein the "actual" door leaf operates only with a vertical component of movement. As a rule, the shaft is connected by cables preferably to the lower edge of the door leaf, these cables being capable of being wound onto and unwound from cable drums fixedly mounted on the shaft. In roller doors, the shaft itself may be a winding shaft and consequently there is no need for an auxiliary device such as the abovementioned cables. A weight compensating device in the form of a spring, particularly a torsion spring with coils wrapped around the shaft or arranged inside the

hollow shaft, engages on the shaft at numerous points.

The door leaves in question, which are motor-driven, particularly electrically operated, work with different drive mechanisms which engage regularly on the shaft described above. The drive mechanism is attached to the shaft, again presumably at one of the shaft ends, laterally outside the shaft bearing associated with this end of the shaft. In a drive which is fixedly mounted independently of the shaft and which has, for example, a chain with a chain pinion operating as the output power take-off member, this pinion may be connected to a flanged structure on a carrier which is non-rotatably fixed on the shaft - cf. Figure 1 for example. Other drives operate with output power take-off members which have hollow shaft constructions which, viewed axially from the side, are pushed onto a shaft end portion projecting correspondingly beyond the associated shaft bearing, in any manner which will ensure a non-rotatable connection between the shaft and output power take-off member of the drive mechanism. Theoretically, a drive mechanism with a necessarily fixed spacing between the drive motor shaft and the axis of the shaft of the door leaf running regularly parallel thereto may be cited as examples thereof, thus, for example, a drive with a chain or geared drive at the power take-off side in a corresponding housing which is held as a unit on the shaft by means of its output power take-off assembly at the shaft end and which is fixedly supported solely with respect to its moment of reaction during operation, e.g. on the frame which also carries the associated mounting for the shaft bearing. Finally, another example which may be mentioned is a drive mechanism which drives the shaft "directly", i.e. from the transmission gear provided immediately downstream of the electric motor. In this case, too, according to the prior art, the output power take-off member constructed as a hollow shaft is pushed onto a shaft end portion which projects

for a corresponding distance over the associated shaft bearing. This drive is also carried by the shaft and is fixedly supported only with respect to its moment of reaction.

The last two examples have the advantage that there is no need whatever for any measures to secure the guiding and tensioning of a motion transmitting member such as a chain, for example, according to the first example, between the shaft and the independently mounted drive motor with transmission gear, as the geared association between the drive motor and shaft axis is at a fixed spacing. The mounting does, however, require a correspondingly modified shaft construction and moreover takes up a relatively large amount of space at the place of installation to the side of the shaft end for the attachment of the drive mechanism, as this unit has to be moved into an empty space beyond the shaft and then has to be pushed onto the shaft end.

The aim of the invention is to provide a shaft of the type in question suitable for the attachment of different drive mechanisms, requiring as little expense or labour as possible to mount, and particularly needing minimal space at the place of installation.

Starting from a built-on device of the type described hereinbefore this aim is achieved by the combination of features in claim 1. The carrier can be connected to different drive mechanisms by means of an adapter or to the desired drive mechanism via a suitably modified output power take-off member.

This measure leads to two special advantages from the point of view of the door manufacturer, namely, first of all, the possibility of producing, stocking and selling the same shaft, possibly preassembled, for attachment to different drives, and secondly being more flexible with regard to the space needed alongside the shaft for mounting the drive at the installation site, i.e. making fewer demands in this respect. Both

measures serve to improve the manufacture and installation of a door of this kind from a technical point of view.

Basically, two embodiments of the teaching according to the invention are possible, namely in general terms providing the built-on device consisting of a carrier on the shaft and an adapter between this and the output power take-off member of the drive mechanism which is to be attached and which can then be used in its conventional construction. Another possibility is to adapt the output power take-off member of the drive mechanism itself, in economically viable numbers, to the carrier which is provided in identical form for all the drives. Thus, this output power take-off member together with the carrier then forms the built-on device. According to another preferred embodiment of the invention, the shaft, preferably constructed as a tube, is provided with a longitudinal groove structure, viewed parallel to the axis from the outer surface, into which the parts which are to be non-rotatably mounted on the shaft, the carrier being of particular interest here, engage through a wedge formation projecting correspondingly radially from the hub, in the manner of a tongue and groove connection. This is possible because the adaptation described above means that there is absolutely no need to take account of the shaft construction with regard to the attachment of the drive mechanism.

These and other preferred embodiments of the invention will become apparent from the subsidiary claims, particularly with reference to the embodiments illustrated in the drawings, which will now be described in order to illustrate the invention. In the drawings:

Figure 1 shows a first embodiment with a chain pinion of a drive motor mounted independently thereof together with transmission gear, attached to a carrier;

Figure 2 shows a second embodiment with a drive

mechanism attached to the carrier, the motor axis of which is fixed relative to the shaft axis;

Figure 3 shows a third embodiment wherein a drive mechanism is connected to the carrier "directly", i.e. with no geared transmission between the motor or subsequent transmission gear output and the output power take-off member of the unit.

The embodiments shown by way of example show the shaft 1 common to all the embodiments, the cross sectional shape of which, on the left-hand side, is shown rotated through 90°. In accordance with this, the shaft 1 is constructed as a hollow shaft and has a longitudinal groove structure 5 running parallel to its longitudinal axis, which is formed by a corresponding concavity of the exterior from the outer surface towards the shaft axis. Mounted on the shaft are cable drums 2 - only one shaft end and hence only one of these drums 2 are shown - which engages non-rotatably with a wedge 6 on the hub of the cable drum 2 in the longitudinal groove structure 5 of the shaft 1. This is secured in its axial position relative to the shaft 1 by means of a locking screw 7 in the hub of the cable drum 2. Towards the associated shaft end, after the drum 2, there is mounted a shaft bearing 3 which is correspondingly fixedly mounted by means of a mounting 4 attached to the frame. Another mounting of this kind (not shown) is located more or less in the region of the opposite end face of the cable drum 2, again in a holder corresponding to the mounting 4, the two mountings being fixable to form a unit which can be attached to the frame. On the side of the shaft bearing 3 remote from the cable drum 2 is a carrier 8 which also engages with a wedge structure 9 in the longitudinal groove structure 5 and is hence non-rotatably connected to the shaft; the carrier 8 is secured against axial movement relative to the shaft by means of a radially movable screw 10. This screw 10, like the locking screw 7, can thus create

an interlocking connection with the shaft by means of the edge facing the shaft. The carrier 8 is provided with a flange structure 11 which is remote from the shaft bearing 3 or the cable drum 2 and adjacent to the associated shaft end in the position shown.

In Fig. 1, a chain pinion 12 is attached to the flange structure 11 of the carrier 8, and indeed is attached non-rotatably by means of a screw connection indicated at 21 which consists for example of three screws distributed around the circumference which pass through the flange structure 11 and corresponding bores in the chain pinion 12. The chain pinion is driven, as the output power take-off member, by a chain 13 indicated in the drawing, which is driven by means of a pinion provided at the end of the drive motor or of the transmission gear downstream thereof. This constitutes a drive assembly the drive motor of which, possibly together with transmission gear, is mounted independently, e.g. on the inner face of the building wall containing the opening which is to be closed off with the door leaf. In such cases, care must be taken to ensure that the transmission chain 13 has the necessary guidance and "tension", e.g. by means of a chain tensioning wheel, as the axial spacing between the drive motor and the axis of the shaft is not rigidly fixed.

The embodiment shown in Figure 2 shows this shaft construction together with cable drum, shaft bearing and carrier 8 as in embodiment 1. The drive mechanism, generally designated 14, is different from the first, however, in that the drive motor and possibly the transmission gear downstream thereof is or are connected to the shaft 1 via a housing (chain box 15) so that the spacing between the shaft of the drive motor and the shaft 1 of the door leaf is bound to be fixed. This is achieved by means of the housing, i.e. the drive mechanism is held on the shaft and fixedly supported, in

a manner not shown here, only with respect to its moment of reaction to the power take-off torque occurring during operation, which may happen as a function of the particular construction of the wall containing the opening which is to be closed off, but may also occur on the frame holding the shaft. In a departure from the previous construction of the output power take-off member as a hollow shaft and hence mounting by pushing onto the end of the shaft, the output power take-off member 18 in this case is constructed as a removable part to adapt to the carrier 8, i.e. the output power take-off member 18 which is rotatably supported on the chain box 15 via a bearing 20 has a connecting region 19 on its input side which is adapted to the flange structure 11 of the carrier 8 and can be non-rotatably fixed thereto via a screwed flange connection 21. The chain pinion 16 non-rotatably connected to the output power take-off member 18 in known manner is connected by a chain 17 to the drive motor or possibly the transmission gear attached thereto in known manner, in a gear ratio of 1 : 1 or in a different ratio. Instead of the chain, transmission members may also be interposed within the so-called chain box 15. This construction makes it possible - as is clear from the drawings - to attach the chain box or the associated drive mechanism in its entirety to the carrier of the shaft 8 taking up very little lateral space at the place of installation.

Figure 3 in turn shows the shaft 1 with cable drum 2, shaft bearing 3, bearing holder 4 and carrier 8 in the embodiment described at the start of the specific description. The drive mechanism 22 is connected directly, by its transmission gear downstream of the drive motor itself, to the shaft 1 of the door leaf, not by being pushed onto a correspondingly laterally projecting shaft end as before, requiring considerable assembly space, but by means of an adapter 24 which is adapted by means of a connecting region 19 on the shaft

side to the flange structure 11 of the carrier 8 of the shaft and can be non-rotatably connected by means of a screw connection 21. The adapter 24 may have a hollow shaft construction 27 into which a protruding shaft end 23 can be inserted in non-rotatable engagement as an output power take-off member of the drive mechanism 22. In another embodiment, a shaft protruding towards the drive mechanism 22 in this way can be constructed on the adapter 24, this shaft engaging in the output power take-off member of the drive mechanism 22 constructed as a hollow shaft. Finally, it is also possible to connect the adapter with hollow shaft structure 27 to the output power take-off member of the drive motor assembly 22 constructed as a hollow shaft by means of a connecting shaft 26. In every case, the drive mechanism 22 can be connected to the shaft via the adapter 24 and the carrier 8 at the place of installation whilst requiring very little space alongside the shaft. The drive mechanism connected directly to the shaft in this way is in turn held on the shaft and requires support only with respect to a moment of reaction occurring during operation, as indicated at 25.

The embodiments shown by way of example thus demonstrate that the same shaft, which may be pre-equipped with its fittings, can be used for different drive mechanisms and importantly, from a practical point of view, without requiring very much space next to the shaft for attaching the appropriate drive mechanism at the place of installation.